

## BIOLOGY OF THE CEANOTHUS STEM-GALL MOTH, *PERIPLOCA CEANOTHIELLA* (Cosens)

WITH CONSIDERATION OF ITS CONTROL\*

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THE STEM-GALL MOTH, *Periploca ceanothiella* (Cosens), has received but slight attention considering its importance as a pest of ornamentals on the genus *Ceanothus*. The genus *Ceanothus*, according to Van Rensselaer and McMinn (1942), comprises some 55 species native only to North America. Of these, some 44 species, and a number of horticultural varieties or selections, are grown in the Pacific Coast states. Many of them exhibit rather colorful bloom, ranging from the white flowers of *C. americanus* (New Jersey Tea) to the deep blue, lilac-like clusters of *C. thyrsiflorus* (Blue Blossom) and the pink of some selections. They occur mainly as shrubs and are used in landscape plantings and roadside beautification. Some, such as *C. gloriosus exaltatus* (Point Reyes Creeper) and *C. griseus horizontalis* (Carmel Creeper) are used as attractive groundcovers because of their low growing habit.

The distribution of the gall moth probably corresponds to the range of its host. Hodges (1962) in reviewing the genus *Periploca* mentions having examined specimens of *P. ceanothiella* collected in California, Kansas, New York, Ontario (Canada), and Texas. His review shifted this insect from the genus *Stagmatophora*, which it formerly occupied, to its present position in the genus *Periploca*.

### DEVELOPMENT

This insect normally overwinters within its gall in some stage of larval development. Reference to Table 1 shows pupation to be barely under way in April and to continue, with moth emergence, throughout spring and early summer. Emergence, however, may begin as early as January from mature larvae brought in from outdoors and maintained under room temperatures.

The small, dark-colored moths (Fig. 1) begin egg laying within a few days following emergence. They deposit their small (0.5 mm) white

\*Presented at the annual meeting of the Entomological Society of America, Phoenix, Arizona—December 3-6, 1962.

TABLE 1. Status of overwintered Periploca ceanothiella galls.

PLACE & DATE 1962	Number of galls exam	PERCENT GALLS			
		With Larvae	With Pupae	With Parasites	Emerged
Arcadia	88	87	2	11	0
	May 18	60	21	15	4
	June 7	23	44	19	14
	July 26	2	6	3	89
Claremont	85	52	28	18	2
	May 16	28	22	11	39
	June 14	19	26	15	40
La Canada	66	94	0	6	0
	May 22	62	4	19	15
Santa Barbara	141	95	1	4	0

eggs on the underside of leaves, in leaf axils, and along the twigs. The eggs required 10 days for hatching under indoor temperatures of about 70° F. The newly hatched larvae move directly into the terminal growth where they penetrate the buds and inflorescences to cause the swellings or galls. Here the larva remains, feeding and growing on the inner tissue, until reaching full growth of 5 to 6.5 mm by the following spring or summer.

Before pupation begins, the larva cuts an exit hole partially through the side of the gall to leave only a thin film of bark which covers the entrance until time for the moth to emerge. This "window" or blocked entrance provides protection for the occupant against some enemies until it is ready to escape from the gall cavity. The pupation stage is spent within the gall and requires 24 days under room temperatures of about 70°F. Although the gall moths may emerge over a prolonged period of spring and summer, only one brood or annual generation was observed.

The pest has a stunting effect on the new growth. The galls may vary greatly in abundance, ranging from only an occasional gall to 20 or more per lineal foot of branch and twigs in heavy infestations. Some

of the twigs may be killed outright from the injury. The most serious damage, however, was to the bloom. (Fig. 2). It was not unusual to see the flower clusters reduced to about 25% of their normal size, particularly where the gall larvae were present in the inflorescences.

In no instance was more than one larva found per gall. In appearance, the gall is somewhat spindle-shaped and averaged about 13mm in length by 6mm diameter. (Fig. 3) This is about three times the diameter of the twig at point of junction with the gall.

### PARASITES

The role of three naturally occurring ichneumonids in checking the stem gall is indicated in Table 1. All three, *Pristomerus baumhoferi* Cush., *Scambus aplopappi* (Ashm.), and *Apistephialtes nucicola* (Cush.), were observed mainly during the spring months. No hyper-parasites were observed. Identifications were made by L. M. Walkley of the U.S. National Museum Staff. Muesebeck, Krombein, and Townes (1951) mention these ichneumonids as parasites of certain micro-lepidopterous larvae that tunnel in stems. Of the three parasites, *P. baumhoferi* was the most commonly encountered, and was the only one previously recorded as a parasite of this stem gall insect. The toll taken by the parasites ranged up to 19% of the gall-larvae. Only the mature larvae were attacked by the parasites.

### NON-SUSCEPTIBILITY IN CEANOTHUS

Examination of Ceanothus collections at the Los Angeles State and County Arboretum in Arcadia, Rancho Santa Ana Botanic Garden at Claremont, and the Santa Barbara Botanic Garden at Santa Barbara (all southern California locations) showed varying degrees of non-susceptibility to the stem galls. It was an ideal way to check on this factor inasmuch as the Ceanothus species and varieties growing in each collection were equally exposed to the pest. The results presented in Table 2 would suggest the use of non-susceptible Ceanothus in plantings wherever practicable.

### CHEMICAL CONTROL

Inasmuch as spraying of the Ceanothus with DDT had given little or no apparent control of this pest it was decided to test the systemic insecticide, dimethoate, for the purpose. A commercial formulation (Cygon) containing 43.5% dimethoate was mixed at the rate of one pint of this concentrate to 100 gallons of water and applied as a foliar spray to Ceanothus plantings in Arcadia on June 27, 1962. Examination made after one week following application showed that 92% of

TABLE 2. Occurrence of Periploca ceanothiella on various species, varieties and horticultural selections of Ceanothus.

HEAVY OCCURRENCE:

*Ceanothus griseus*  
*C. griseus horizontalis*

MODERATE OCCURRENCE:

*C. cyaneus*  
*C. thyrsiflorus*  
*C. 'Ray Hartman'*  
*C. 'Marie Simon'*

LIGHT OCCURRENCE:

*C. arboreus*  
*C. oliganthus*  
*C. diversifolius*  
*C. lemmmonii*  
*C. integrifolius*  
*C. leucodermis*  
*C. lobbianus*  
*C. 'Treasure Island'*  
*C. 'Sierra Blue'*  
*C. 'Royal Blue'*  
*C. 'Mountain Haze'*  
*C. 'Mary Lake'*  
*C. 'Concha'*

NO OCCURRENCE:

*C. americanus*  
*C. parryi*  
*C. papillosum*  
*C. impressus*  
*C. foliosus*  
*C. insularis*  
*C. cuneatus*  
*C. ramulosus fascicularis*  
*C. gloriosus*  
*C. gloriosus exaltatus*  
*C. rigidus albus*  
*C. purpureus*  
*C. prostratus*  
*C. verrucosus*  
*C. spinosus*  
*C. jepsonii*  
*C. masonii*  
*C. megacarpus*  
*C. greggi perplexus*  
*C. 'Blue Cloud'*  
*C. 'Lester Rowntree'*

the gall larvae were killed. The spray, however, had no apparent effect on the mature gall larvae (which had ceased feeding), the pupae, or the parasites, *P. baumhoferi* and *A. nucicola*; adults of these normally emerged from galls collected from the treated areas. Effect of the treatment on *S. aplopappi* was not observed. The parasites developed only in the mature gall larvae, and therefore it is unlikely that they had had any contact with the insecticide. In addition to checking the stem gall infestation, the dimethoate also controlled the Ceanothus leaf miner, *Nepticula ceanothi* Braun, thrips, and an infestation of mites which were troublesome at the time. The spray used at this rate had no observable phytotoxic effect on the Ceanothus.

A similar application made on September 14, 1962 showed only 74% mortality of the gall larvae. This lower kill may have been due to the greater proportion of older, possibly more resistant, larvae at this time than at the June 27th spraying.

A soil drench of the dimethoate, made at six times the strength of the foliar spray, applied around the base of Ceanothus shrubs in Pasadena on July 11, 1962, resulted in 70% mortality of the gall larvae, but

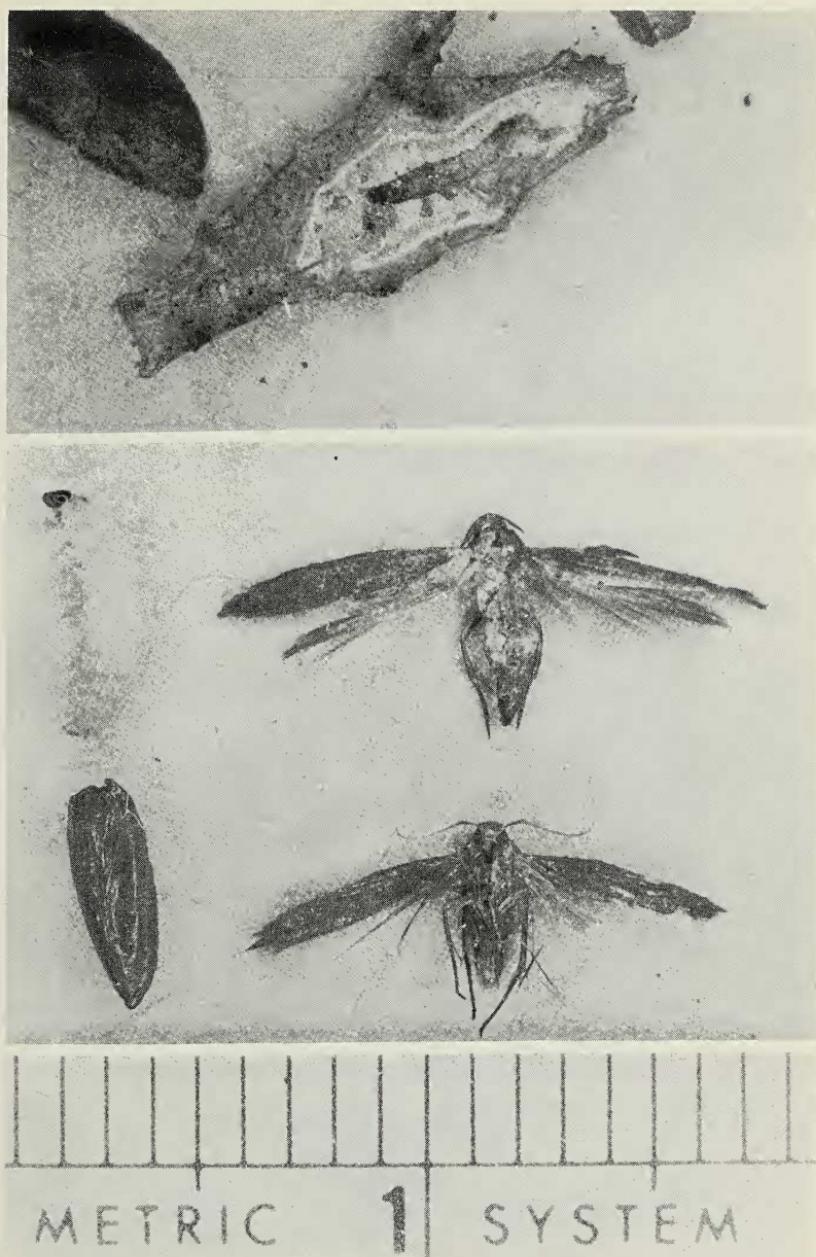


Fig. 1. The adult moth, *Periploca ceanothiella* (Cosens), at bottom right; larva and pupa at left; larva in cut gall at top.

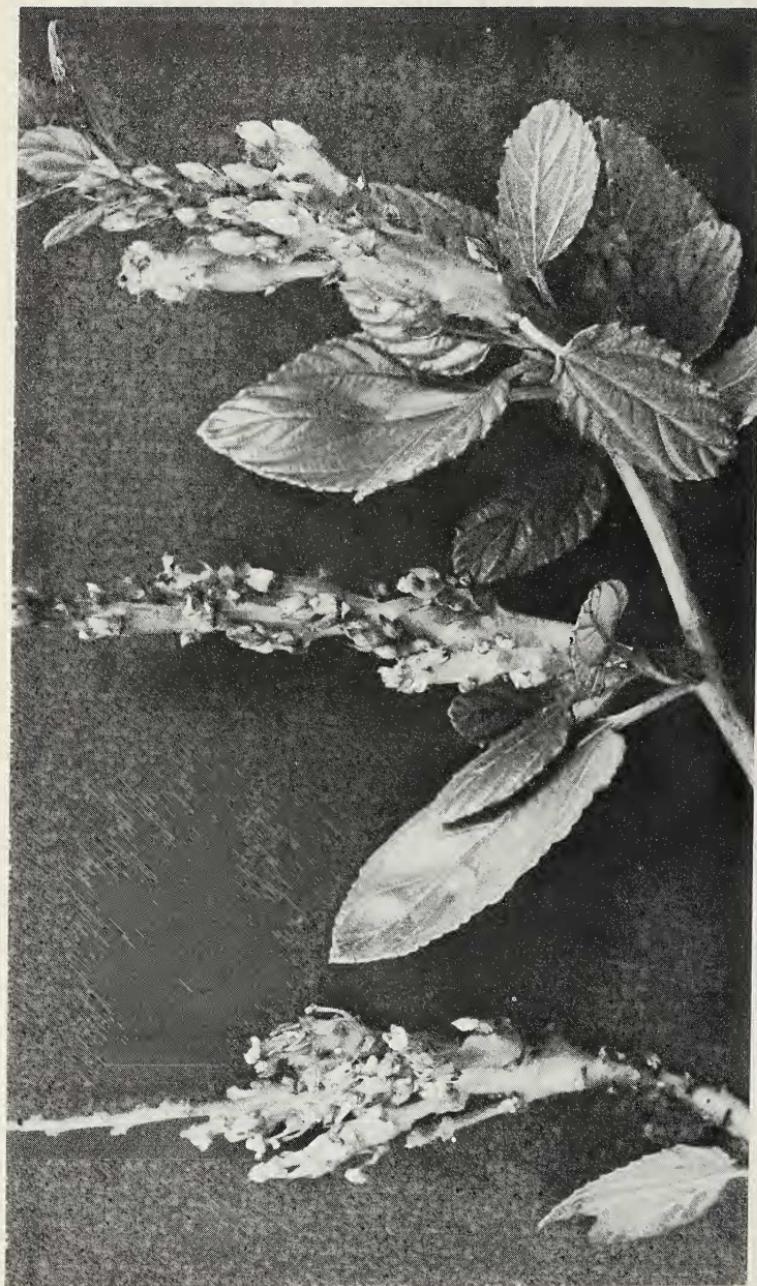


Fig. 2. Stem-galls caused by the larvae of *Periplaea ceanothella* C. on the stems of *Ceanothus thyrsiflorus*, showing swollen inflorescences and almost complete destruction of the flowering buds.

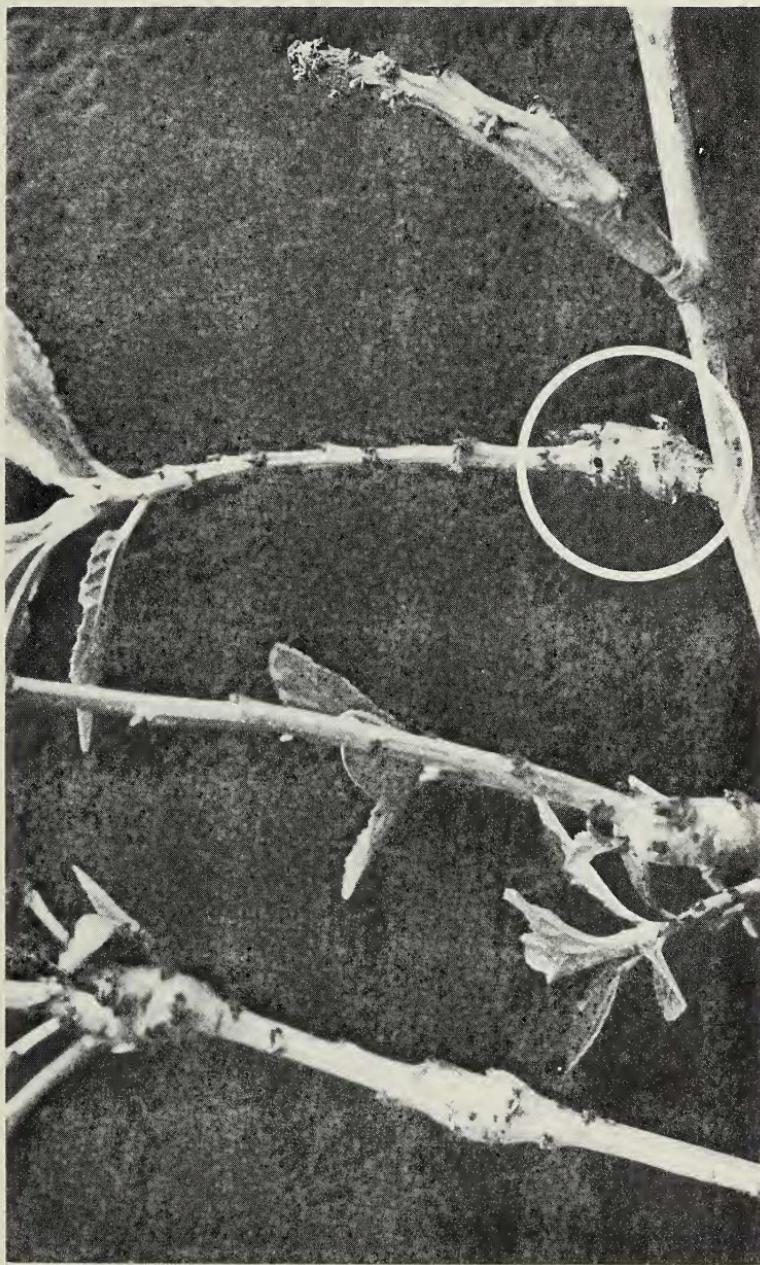


Fig. 3. Stem galls from which the moths have emerged; note the exit hole in the encircled gall. The twig at the right has been completely killed by the larvae. Note that the galls occur at the beginning of each period of stem growth, and that in the twig at the left, two different years' galls are shown.

caused burning and subsequent defoliation wherever the drench came in contact with the low-growing foliage. Examination of galls from untreated *Ceanothus* coinciding with observation on the treated shrubs, showed natural mortality of less than one percent, and of no significance.

Limited observations on *Ceanothus* growing in the wild showed the stem-galls to be less abundant than on *Ceanothus* grown under cultivation. This might indicate that irrigation and other care which these ornamentals received under cultivation makes them more attractive to this gall insect.

### SUMMARY

The stem-gall moth, *Periploca ceanothiella* (Cosens), is a pest of ornamental shrubs in the genus *Ceanothus*. The moths emerge from the galls and lay their eggs throughout spring and early summer. There is but one generation or annual brood. Three naturally occurring ichneumonid parasites accounted for up to 19% mortality of the maturing gall larvae. No hyperparasites were observed. Examination of 40 species and varieties of *Ceanothus* growing in mixed collections at several southern California locations showed 2 with heavy occurrence of the galls, 4 with moderate occurrence, 13 with light occurrence, and 21 with no occurrence. This would suggest the planting of the more non-susceptible varieties to alleviate or avoid the problem where practicable. Dimethoate used as a foliar spray proved highly effective against the immature gall larvae, as well as the leaf miner, thrips, and mites, but had no apparent effect on the mature gall larvae and pupae, or the parasites. Limited observations indicated the galls to be more troublesome on *Ceanothus* growing under cultivation than in the wild.

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